

Table S1. Red scoria quarrying and possible quarrying on Easter Island

Name	Map no	Geological type	Landform	Type of stone	close utilized match nearby	morphological evidence of in situ working/ quarrying
Maunga Puna Pau	1	welded cinder	cone	fine granular	yes	yes — artificially cut quarry bays; abundant tools
<i>Ahu</i> Akahanga	2	spatter	craggy undulating ground	inhomogeneous	yes	possibly — artificial quarry bay-like cut
Hanga Hahave/ Moai a Umu	3	spatter	craggy undulating ground	inhomogeneous	yes	yes — artificially modified outcrop morphology
<i>Ahu</i> Hoa Anga Vaka o Tua Poi	4	spatter	craggy undulating ground	homogeneous/ inhomogeneous	yes	no
Hanga Maihiku	5	spatter	craggy undulating ground	inhomogeneous	yes	possibly — artificially modified outcrop morphology
Hanga O Teo	6	spatter	sea cliff in craggy undulating ground	homogeneous	yes	yes — modified outcrop morphology
Maunga O'Tuu	7	spatter	ridge	homogeneous	yes	yes — in situ carving (2 moai)
Maunga Okoro	8	welded cinder	cone	fine granular	yes	possibly — possible in situ carving (4–6 moai) of scree
<i>Ahu</i> Oroí	9	spatter	craggy gently sloping ground	homogeneous/ inhomogeneous	yes	no
Ovahe beach (Maunga Te Puha Roa)	10	welded cinder	sea cliff in cone	fine-coarse granular	no	yes — artificially cut cave or quarry bay
Puka Ga Aha Aha	11	spatter	ridge	homogeneous	no	abundant stone working tools
north of <i>Ahu</i> Runga Va'e	12	spatter	craggy gently sloping ground	homogeneous	yes	yes — artificially modified outcrop morphology
Tahai	13	spatter	craggy undulating ground	inhomogeneous	yes	no
Maunga. Tararaina	14	welded cinder	ridge	fine granular	no	no
<i>Ahu</i> Te Peu	15	spatter	crag	inhomogeneous	yes	no
Vaihu	16	spatter	coastal reef; craggy gently sloping ground	inhomogeneous	yes	no
Vinapu	17	welded cinder-spatter	steeply sloping ground	fine granular and inhomogeneous	yes	yes — artificially cut quarry bays; abundant stone working tools

Table S2. Red scoria in *ahu* (adapted from Martinsson Wallin 1994 and Tilburg 1986, with additions). † = not seen by MST

<i>Ahu</i>	Puna Pau red scoria facia blocks on or in immediate vicinity of ahu	Puna Pau red scoria in back wall	Other red scoriae in back wall	Known proximate source (within 500m) of red scoria	Close visual match
Akahanga	yes	no	yes	yes	yes
Hanga Hahave	no (dressed blocks of uncertain origin)	no	yes	yes	yes
Hanga Poukura	yes†	no	yes	yes	unknown
Hanga Maihiku 066860/699702	no	no	yes	yes	yes
Hanga Tee	yes (crushed between moai & flow lava facia)	no	yes	yes	unknown
Hekii (main ahu)	yes	no	yes	no	n/a
Hoa Anga Vaka o Tua Poi	no	no	yes	yes	yes
Moai Tuu Paro	no	no	yes	yes	yes
Nau Nau	yes	no	no	yes	n/a
O Ure	yes	no	unknown	yes	n/a
One Makihi	yes	no	yes	yes	yes
Oroi	no	no	aberrant moai	yes	undressed boulders in vicinity of ahu
Papa Tekena 066391/700572	yes	no	no	no	n/a
Runga Va'e	possibly (stone partially obscured)	no	yes	yes	yes
Tarakiu	yes	no	yes	yes	yes & no
Te Peu	yes	no	yes	yes	yes & no
Te Pito Kura	yes†	no	no	no	n/a
Tetenga	no	no	yes	yes	yes
Hanga Pu Ngao 066884/699704	no	no	yes	yes	yes
Ura Uranga Te Mahina	yes (crushed between moai & flow lava facia)	no	no	yes	n/a
Ura Urenga	no	yes	unknown	yes	n/a
Vai Mata	yes	no	no	no	n/a
Vai Ure (Tahai)	no (dressed blocks in pavement revetment & 'slipway' complex)	no	unknown (dressed blocks in pavement revetment)	yes	yes
Vinapu complex	yes	no	yes	yes	yes
Totals	14/47	1/ 47	16/ 44	15/ 16	11-13/ 15

Table S3. Red scoriae in boat-shaped houses

Site	No of houses examined	With Puna Pau red scoria curbstones	With other red scoria curbstones	Known source of other red scoria within 500m	Close visual match	Peripheral position(s)
Akahanga	8	none	3	yes	yes	3/3
Ana Te Pahu/ Akivi	5	none	none	no	n/a	n/a
Hanga Hahave	2	none	2	yes (very dark)	yes	1/2
Hanga Maihiku	4	none	4	yes	yes	0/4
Hanga Nui	2	none	none	no	n/a	n/a
Hanga Taharoa	1	none	none	no	n/a	n/a
Hoa Anga Vaka A Tua Poi	1	none	1	yes	yes	1/1
Mahatua	3	none	none	no	n/a	n/a
Maitaki Te Moa	2	none	none	no	n/a	n/a
southwest <i>Ara Moai</i>	7	none	3	yes	yes	3/3
Omohi	2	none	none	no	n/a	n/a
One Makihi	1	none	none	no	n/a	n/a
Oroi	3	none	2	yes	yes	2/2 but includes a re-used passage stone
Oroi-Tetenga	2	none	1	yes	yes	1/1 but includes a re-used passage stone
Papa Tekena	3	none	none	no	n/a	n/a
Te Peu	7	2	2	yes	yes	4/4
Te Peu-Maitaki te Moa	2	2	none	no	n/a	2/2
Tetenga	1	none	1	yes	yes	1/1
Tongariki	1	none	none	no	n/a	n/a
Tuu Ko Ihu	1	none	none	no	n/a	n/a
Tuu Ko Ihu-Papa Tekena	3	none	none	no	n/a	n/a
Tuu Tahi	1	1	1	yes	yes	0/1
Ura Uranga Te Mahina	3	none	2	yes	yes	1/2
Vai Mata	6	none	none	no	n/a	n/a
Vinapu	3	none	none	yes	n/a	n/a
Totals	74	4/ 74	22/ 74	11/ 11	10/ 10	16-18/ 25

Table S4. Red scoria “aberrant” *moai* (adapted from Van Tilburg 1986, with additions)

Site	Red scoria type *not seen by MST					Locus	Known source of other red scoria within 500m	Close visual match
	<i>Puna Pau</i>	<i>Inhomogeneous (Vinapu/ Tahai) type</i>	<i>Okoro type</i>	<i>Homogeneous (O'Tuu) type</i>	<i>Unknown*</i>			
near Anakena					1	unknown	yes	unknown
<i>Ahu</i> Hoa Anga Vaka A Tua Poi				1		head: <i>ahu</i> plaza; torso: on left wing	yes	undressed boulders in <i>ahu</i> core
Moai A Umu		1				cliff edge	yes	yes
<i>Ahu</i> Hekii				1	1	end wall of <i>ahu</i> left wing/ ramp	no	no
<i>Ahu</i> Moai Tuu Paro (Hanga O Teo)				1		in <i>ahu</i> core	yes	yes
<i>Maunga</i> Okoro			4			scree below a crater	yes	yes
<i>Maunga</i> O'Tuu				2		hill terrace	yes	yes
near <i>Maunga</i> Pui		1				edge of crater	yes	unknown
<i>Ahu</i> Oro				1		rear wall of <i>ahu</i>	yes	undressed boulders in vicinity of <i>ahu</i>
Tahai complex		4				near <i>ahu</i>	yes	yes
<i>Ahu</i> Vinapu 2	1					<i>ahu</i> plaza	n/a (yes)	n/a
Totals	1	18					10/ 10	7/ 10

Table S5. Rock art on topknots (from Lee 1992, with additions)

Site	Motifs	Motifs not represented on topknots
Akahanga	Cupules Frigate bird Make make eye mask	Birdmen Boat-shaped houses Chickens Fishhooks Tuna fish Turtles Vulvas, etc.
Te Vai (Hanga Maihiku)	Cupules Face	
Hanga Tee	Canoes Cupules Spiral/ (?)Fishhook	
Hanga Poukura	Cupules	
One Makihi	Cupules (canoes on Puna Pau red scoria facia blocks)	
Puna Pau	Canoes Small cupules Fish	
Te Pito Kura	Cupules	
Tongariki	Cupules	
Tuu Tahi	Cupules	
Vai Mata (top knot burial)	Cupules	
Vinapu	Canoes Cupules	

OMITTED MATERIAL

Working methods

Prior to our excavations methods of prehistoric red scoria working were known to us only from weathered, possible tool marks, some tools from the crater, and a number of broad cuts through fallen and/ or abandoned topknots. To this we have added un-weathered tool marks, an abundance of tools, and quarry tailings, associated with large numbers of fresh flakes from the dressing and re-dressing of tools. There is also evidence for the large-scale movement of the tailings around the quarry. Together these form a closely interpretable set.

The principal tool type used is flat, roughly knapped, with rounded, pointed or squared blades (figure 4: middle left). The principal stone used for these is a tough naturally tabular flow lava from the Rano Kau area, the large volcano forming the westernmost end of the Island. The nearest known source of this stone is about 4 km away as the crow flies. Most of the tools we found are broken, and although we have working ends, middles and butt ends, we have few completely reconstructable tools and do not know how long most were. Earlier finds from the site, however, all now lost, included tools with sword-like proportions (E. Edwards pers. comm.). For the most part usewear is symmetrical, while on many, striations visible to the naked eye, run parallel with the tools' long axes suggesting that their use entailed an adze-like, rather than an axe-like motion. Further light wear on their side edges indicates that working was carried out to some depth. Given a lack of evidence for crushing on the butt ends found so far I am inclined to rule out the use of secondary percussion.

The interpretation of these tools as adze-like is consistent with surviving tool marks at the quarry, all of which are more or less vertical. High on an exposed quarry face are heavily weathered marks similar in width to tools recovered by us during our excavations. Much narrower, marks buried by prehistoric sediments, were probably made by the side of a tool used at right angles to the quarry face during extraction (figure 4: top right). Wide wedge-shaped cuts in the quarry face and in a nearby topknot may also be prehistoric.

Finally, and most importantly in terms of understanding stone extraction, are the tailings, the waste stone left behind by stone removal and dressing. These comprise useless stone — red scoria too soft to carve and other stone types such as a poorly consolidated breccia consisting of cobble-sized 'fusiform' bombs, which at Puna Pau overlies the best scoria and was removed when the later was extracted. Owing to the similarity between disaggregated welded red scoria and the poorly welded stone overlying this it is difficult to distinguish in situ tailings from natural colluvium and material that has been deliberately moved. Indeed they must in many cases be the same thing. However, the inclusion in red scoriaceous sediments of high densities of fresh flakes from the re-dressing of tools as well as the

interleaving of red scoriaceous sediments, prehistoric occupation surfaces and layers comprising wholly or mostly local stone other than red scoria — such as the bombs referred to above — gives us confidence that at least some of the deposits consist wholly or partially of tailings.

The dominant characteristic of all the deposits is the small size of the red scoria comprising them. While there are stones of fist and larger-size (rarely >10% volume), most are granule-sized or smaller suggesting that scoria working entailed its disaggregation or crushing, rather than levering and flaking. The effect of this can be compared to that of a modern angle-grinder, which can cut very fragile stones without breaking them, and is both well suited to a stone like red scoria and paralleled by pounding techniques used in dressing the Island's harder flow lavas.

Quarry organization

The lip and interior of the crater at Puna Pau today are quite different from those of the Island's other scoria cones. The latter are mostly classic cones with rounded, gently contoured craters that testify to years of undisturbed weathering. Puna Pau by contrast is asymmetrical; its interior steep-sided with many bumps and hollows. For the most part this difference is the result of quarrying and quarry related activities. The movement and mixing of sediments consequent on quarrying conspires against a full understanding of these both below and above ground and much of what we see will probably never be fully understood. But by using a combination of surface topography, geology, soils and finds, and geophysics, we have at least made a start towards this end.

As already noted, the particular red scoria sought lay at the base of the visible crater. Surface sediments here are mostly indivisible but downslope of the last exposed quarry face (where we sited our excavation trench) is a prominent terrace of red scoriaceous material, and rising gently from the lowest part of the crater into a part of it that comprises non-scoriaceous sediments, a spread of similar material, likewise ending in a sharp break of slope. Though without surface finds both of these are best interpreted as dumps, the first up-cast directly from the working quarry face, the other perhaps removed from the quarry into a sterile area. For the latter this view is supported by the geophysics, which shows a sharp break not clearly visible on the surface between the underlying and overlying sediments; and the identification during excavation of tip lines from a substantial dump, which no longer exists. We also encountered 35–60 cm of red scoriaceous colluvium overlying the road outside the crater, and concentrations of artefactual material here, on the inner slopes of the crater to the north and northeast, and on the northeast lip of the crater (above the roadway), which suggest further spoil dumping or — more probably — an activity area or areas in or near these locations involving the finishing of topknots or the re-dressing of tools. (Other elevated areas were favoured for knapping tools on the Island — [Hamilton *et al.* 2011, 179](#)).

There is also hard evidence for up to three ways out of the quarry. One leads from close to our excavation trench, where, in front of a quarried in-turn in the crater wall, an artificial bank starts out for the aforementioned notch in the lip of the crater and the excavated road. (Between the two, the interior of the crater has slumped massively, so there is no sign now of a road joining them). The second is suggested by a geophysical anomaly, which excavation showed to correspond with a succession of buried, apparently laid, surfaces, running from the deepest part of the crater to the red scoriaceous spread to the southeast, and a sloping terrace close to the lip of the crater immediately above the end of the spread ([Cadwell *et al.* 2013](#)). Possibly a road zigzagged up the crater from the latter to the terrace and the lip of the crater, which hereabouts appears to have been enhanced by yet more scoriaceous spoil. The third possible way out is indicated by a deep gully, which contains a topknot, and runs along the northern lip of the crater.